CLAIMS

What is claimed is:

1. A consumable product unit comprising:

a first determination element determining whether a replaced consumable product is a new consumable product;

a second determination element determining a type of the consumable product;

a first connection terminal connected to a first end of the first determination element;

a second connection terminal connected to a first end of the second determination element; and

a third connection terminal commonly connected to second ends of the first and second determination elements.

2. The consumable product unit of claim 1, wherein the first determination element is a first resistor having a predetermined first resistance value.

3. The consumable product unit of claim 2, wherein the first resistor is a fusible resistor, which melts to disconnect from at least one of the first and third connection terminals when an over-current is supplied.

4. The consumable product unit of claim 1, wherein the second determination element is a second resistor having a predetermined second resistance value, the second resistance value being higher than the first resistance value.

5. The consumable product unit of claim 4, wherein the second resistance value varies according to a manufacturer of the consumable product.

6. The consumable product unit of claim 4, wherein the second resistance value varies according to a type of the consumable product.

7. The consumable product unit of claim 1, wherein the consumable product is a cartridge having one or more predetermined color developers.

8. A consumable product replacement sensing system comprising:

a mountable consumable product unit determining whether a consumable product is a new consumable product and determining a type of the consumable product; and

a consumable product replacement sensing apparatus determining whether a mounted consumable product unit is the new consumable product unit and determining the type of the mounted consumable product unit.

9. The consumable product replacement sensing system of claim 8, wherein the consumable product unit comprises:

a first determination element determining whether the mounted consumable product is the new consumable product;

a second determination element determining the type of the mounted consumable product in the consumable product replacement sensing apparatus;

a first connection terminal connected to a first end of the first determination element;

a second connection terminal connected to a first end of the second determination element; and

a third connection terminal commonly connected to second ends of the first and second determination elements.

10. The consumable product replacement sensing system of claim 9, wherein the first determination element is a first resistor having a predetermined first resistance value.

11. The consumable product replacement sensing system of claim 10, wherein the first resistor is a fusible resistor, which melts to disconnect from at least one of the first and third connection terminals when an over-current is supplied.

12. The consumable product replacement sensing system of claim 9, wherein the second determination element is a second resistor having a predetermined second resistance value, the second resistance value being higher than the first resistance value.

13. The consumable product replacement sensing system of claim 12, wherein the second resistance value varies according to a manufacture and/or type of the consumable product.

14. The consumable product replacement sensing system of claim 9, wherein the consumable product replacement sensing apparatus comprises:

fourth through sixth connection terminals electrically and respectively connected to the first through third connection terminals;

a new product determining signal generating unit generating a level of electrical potential corresponding to at least one of the first and the second determination elements connected to the consumable product replacement sensing apparatus through the fourth and fifth connection terminals to determine whether the consumable product unit is the new consumable product;

an over-current supplying unit intermitting a current-flow path continuing from the fourth connection terminal through the first determination element to the sixth connection terminal by supplying an over-current to disconnect the first determination element from the at least one of the first and third connection terminals; and

an engine control unit controlling the over-current supplying unit to disconnect the first determination element from at least one of the first and third connection terminals if the consumable product is determined to be the new consumable product by the level of electrical potential generated at the new product determining signal generating unit, the engine control unit determining the type and/or manufacturer of the consumable product by the level of electrical potential corresponding to the second determination element.

15. The consumable product replacement sensing system of claim 14, wherein:

the engine control unit determines that the consumable product is the new consumable product if the level of electrical potential outputted from the new product determining signal generating unit is a first electrical potential level corresponding to the first and second determination elements, and determines that the consumable product is a used consumable product if the level of electrical potential outputted from the new product determining signal generating unit is a second electrical potential level corresponding to the second determination element, and

the first electrical potential level is lower than a reference level, and the second electrical potential level exceeds the reference level.

16. The consumable product replacement sensing system of claim 14, further comprising:

a shared port such that the level of electrical potential to determine whether the consumable product unit is the new consumable product unit and the level of electrical potential corresponding to the second determination element are inputted from the new product determining signal generating unit to the engine control unit through the shared port.

17. The consumable product replacement sensing system of claim 14, wherein the new product determining signal generating unit comprises:

a first power source;

a third resistor having a first end connected to the first power source and a second end communicating with the engine control unit and connected to the fifth connection terminal; and

a diode disposed between the fourth and fifth connection terminals to prevent an electric current of the fourth connection terminal from flowing into the fifth connection terminal.

18. The consumable product replacement sensing system of claim 14, wherein the over-current supplying unit comprises:

a second power source; and

a switching element to connect the second power source to or to disconnect the second power source from the fifth connection terminal according to a control signal of the engine control unit.

19. The consumable product replacement sensing system of claim 8, wherein:

the consumable product comprises a cartridge containing one or more predetermined color developers,

the consumable product unit provided with the consumable product comprises a developing device that develops an image by using the one or more color developers supplied from the consumable product, and

the consumable product replacement sensing apparatus is provided in an image forming apparatus that forms the image developed by the developing device on a paper.

20. A consumable product replacement sensing method comprising:

mounting a consumable product unit in a consumable product replacement sensing apparatus;

when the consumable product unit is mounted, determining whether the consumable product is a new consumable product; and

determining whether the consumable product is a consumable product useable in the consumable product replacement sensing apparatus and/or determining a manufacturer of the consumable product.

21. The consumable product replacement sensing method of claim 20, wherein the mounting of the consumable product unit comprises:

respectively and electrically connecting first through third connection terminals provided in the consumable product unit to fourth through sixth connection terminals provided in the consumable product replacement sensing apparatus and the first connection terminal is connected to a first end of a first determination element to determine whether the consumable product is new, the second connection terminal is connected to first end of a second determination element to determine whether the consumable product is usable, and the third connection terminal is commonly connected to second ends of the first and second determination elements.

22. The consumable product replacement sensing method of claim 21, wherein the determining of whether the consumable product is the new consumable product comprises:

generating a level of electrical potential corresponding to at least one of the first and second determination elements connected to the consumable product replacement sensing apparatus through the fourth and fifth connection terminals; and

determining whether the consumable product is the new consumable product by the level of electrical potential.

23. The consumable product replacement sensing method of claim 21, wherein the determining of whether the consumable product is usable and/or of a manufacturer thereof comprises:

supplying an over-current to the first determination element to disconnect the first determination element from at least one of the first and third connection terminals when the consumable product is determined to be the new consumable product; and

determining whether the consumable product is usable and/or determining the manufacture thereof by the level of electrical potential corresponding to the second determination element.

24. The consumable product replacement sensing method of claim 22, wherein the determining of whether the consumable product is the new consumable product further comprises:

determining that the consumable product is the new consumable product if the level of electrical potential is a first electrical potential level corresponding to the first determination element; and

determining that the consumable product is a used consumable product if the level of electrical potential is a second electrical potential level corresponding to the second determination element, the first electrical potential level being lower than a reference level.

25. The consumable product replacement sensing method of claim 23, wherein the supplying of the over-current to the first determination element to disconnect the first determination element from the at least one of the first and third connection terminals comprises:

melting the first determination element, which has a predetermined first resistance value and is a fusible resistor, to disconnect the at least one of the first and third connection terminals when the over-current is supplied.

26. The consumable product replacement sensing method of claim 25, wherein the second determination element has a predetermined second resistance value, which is higher than the first resistance value.

27. The consumable product replacement sensing method of claim 26, further comprising:

varying the second resistance value according to the type and/or manufacturer of the consumable product.

28. The consumable product replacement sensing method of claim 20, wherein

the consumable product comprises a cartridge containing one or more predetermined color developers;

the consumable product unit provided with the consumable product comprises a developing device that develops an image by using the one or more color developers supplied from the consumable product; and

the consumable product replacement sensing apparatus is provided in an image forming apparatus that forms the image developed by the developing device on a paper.

29. The consumable product replacement sensing method of claim 22, wherein the generating of the level of electrical potential comprises:

outputting through a shared port the level of electrical potential to determine whether the consumable product is the new consumable product and the level of electrical potential corresponding to the second determination element.

30. A sensing apparatus for recognizing a consumable unit, the consumable unit including a consumable product, first through third connection terminals each connected to the sensing apparatus, and having a first resistive element having a first resistance value across the first and third terminals of the consumable unit and a second resistive element having a second resistance value across the second and third terminals of the consumable unit, the sensing apparatus comprising:

a signal generating portion to generate a signal corresponding to a parallel composite resistance value of the first and second resistive elements of the consumable unit connected to the signal generation portion;

a disconnecting portion to disconnect a current path from the first connection terminal of the consumable unit to the third connection terminal of the consumable unit; and

a controller to control the disconnecting portion to disconnect the current path and to compare a level of the signal that is generated from the signal generating portion with predetermined standard levels to determine whether the consumable unit is usable in a system and/or to determine a manufacturer of the consumable unit using the sensing apparatus.

31. A sensing apparatus for recognizing a consumable unit including parallel resistive elements, comprising:

a signal generating portion to generate a signal corresponding to a parallel composite resistance value of the consumable unit connected to the signal generation portion;

a disconnecting portion to selectively disconnect a respective one of the parallel resistive elements of the consumable unit; and

a controller to control the disconnecting portion to disconnect the respective one of the parallel resistive elements and to compare a level of the signal that is generated from the signal generating portion, after the respective one of the parallel resistive elements is disconnected, with predetermined standard levels to determine whether the consumable unit is usable in a system and/or to determine a manufacturer of the consumable unit using the sensing apparatus.

32. A method of recognizing whether a consumable unit is replaced, the consumable unit including a consumable product, first through third connection terminals each connected to a sensing apparatus, and having a first resistive element having a first resistance value across the first and third terminals of the consumable unit and a second resistive element having a second resistance value across the second and third terminals of the consumable unit, the method comprising:

electrically connecting fourth through sixth connection terminals of the sensing apparatus, respectively, to the first through third connection terminals of the consumable unit;

generating a signal corresponding to a parallel composite resistance value of the first and second resistive elements of the consumable unit through the first and second terminals;

disconnecting a current path from the first connection terminal of the consumable unit to the third connection terminal of the consumable unit, if the consumable unit is determined to be new based on a level of the generated signal corresponding to a reference level for which the current path is not disconnected; and

after the disconnecting of the current path, determining whether the consumable unit is useable in a system and/or determining a manufacturer of the consumable unit by measuring the generated signal level.

33. A method of recognizing whether a consumable unit is replaced, the consumable unit including a consumable product, first through third connection terminals each connected to a sensing apparatus, and having a first resistive element having a first resistance value across the first and third terminals of the consumable unit and a second resistive element having a second resistance value across the second and third terminals of the consumable unit, the method comprising:

generating a signal corresponding to a parallel composite resistance value of the first and second resistive elements of the consumable unit;

disconnecting a current path from the first connection terminal of the consumable unit to the third connection terminal of the consumable unit, if a level of the generated signal is less than a reference level; and

after the disconnecting of the current path, comparing the level of the generated signal with predetermined standard levels to determine whether the consumable unit is usable in a system using the sensing apparatus and/or to determine a manufacturer of the consumable unit.

34. A method of sensing a consumable unit including parallel resistive elements, comprising:

generating a signal corresponding to a parallel composite resistance value of the first and second resistive elements of the consumable unit;

selectively disconnecting a respective one of the parallel resistive elements of the consumable unit; and

after the selectively disconnection of the respective one of the parallel resistive elements, comparing a level of the generated signal with predetermined standard levels to determine whether the consumable unit is usable in a system and/or to determine a manufacturer of the consumable unit.

35. A sensing system, comprising:

a consumable unit to be replaced, the consumable unit comprising:

a consumable product, and

first through third connection terminals having a fuse element with a first resistance value across the first and third terminals of the consumable unit and a second resistive element with a second resistance value across the second and third terminals of the consumable unit;

a connector portion having fourth through sixth connection terminals electrically connected to the first through third connection terminals, respectively;

a signal generating portion generating a signal corresponding to an effective resistance value of the consumable product unit connected to the signal generation portion through the fourth and fifth connection terminals of the connector portion;

a fuse disconnecting portion intermitting a current-flowing path continuing from the fourth connection terminal of the connector portion through the fuse element to the sixth connection terminal of the connector portion; and

a determining portion controlling the fuse disconnecting portion to disconnect the fuse element if the consumable product of the consumable product unit is determined to be a new consumable product unit by the signal generated from the signal generating portion, and determining whether the consumable product unit is useable in a system or determining a manufacturer of the consumable unit by the generated signal, corresponding to a resistance value of the second resistive element, which is subsequently generated from signal generating portion.

36. A consumable product unit comprising:

a new product determining element determining whether a consumable product is a new consumable product;

a type determining element determining a type and/or a manufacturer of the consumable product;

a first connection terminal connected to a first end of the new product determining element;

a second connection terminal connected to a first end of the second determining element; and

a third connection terminal commonly connected to second ends of the new and second determining elements.

37. A consumable product replacement sensing method comprising:

mounting a consumable product unit in a consumable product sensing apparatus;

determining whether the consumable product is a new consumable product;

determining whether the consumable product is a consumable product useable in the consumable product replacement sensing apparatus and/or determining a manufacturer of the consumable product; and

outputting status information of the consumable product from the determining operations.

38. A sensing system, comprising:

a consumable unit including parallel resistive elements; and

a sensing apparatus to recognize the consumable unit comprising:

a signal generating portion to generate a signal corresponding to a parallel composite resistance value of the consumable unit connected to the signal generation portion,

a disconnecting portion to selectively and permanently disconnect a respective one of the parallel resistive elements of the consumable unit, and

a controller to control the disconnecting portion to disconnect the respective one of the parallel resistive elements and to compare a level of the signal that is generated from the signal generating portion, after the respective one of the parallel resistive elements is disconnected, with predetermined standard levels to determine whether the consumable unit is usable in a system and/or to determine a manufacturer of the consumable unit using the sensing apparatus.